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## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### THE TWENTY-SIXTH ANNUAL MEETING OF THE PACIFIC DIVISION

Edited by Professor J. MURRAY LUCK

SECRETARY

THE twenty-sixth annual meeting of the Pacific Division, American Association for the Advancement of Science, was held at Salt Lake City, Utah, during the week of June 15, 1942. The meetings extended over six days.

It was a notable week and an occasion deserving of record. Despite the exigencies of war and the pressing obligations of an unparalleled emergency, almost 400 scientists of the far western states were able to gather together for the purpose of friendly intercourse and the ever-necessary exchange of information from many fields of scientific research.

The meetings were of a particularly high quality

throughout. General sessions commenced on the morning of June 15 with a symposium on "The Great Basin, with Emphasis on Glacial and Post-Glacial Times," in which three papers were presented by men whose studies have been largely centered upon the problems under discussion. The three papers were as follows: "The Geological Background," Dr. Eliot Blackwelder; "The Zoological Evidence," Dr. C. L. Hubbs and Dr. R. R. Miller, and "Climatic Changes and Pre-White Man," Dr. Ernst Antevs. The papers presented were of great interest, and it was thought by many that this symposium was one of the finest in the history of Pacific Division meetings.

On Tuesday afternoon at 1:30 the general sessions continued with "Reviews of Current Research," a session which consisted of four papers designed to review recent contributions in various scientific fields. The reviews presented were "Relationship Between Molecular Configuration and Resonance," G. E. K. Branch; "Recent Advances in Entomology," G. F. MacLeod; "Recent Developments in the Field of Disinfection," E. C. McCulloch; "Recent Work on Virus Diseases of Plants," C. W. Bennett.

At four o'clock President and Mrs. Cowles received the members and guests of the division and associated societies in the Union Building on the university campus.

On Tuesday evening Professor D. R. Hoagland, president of the Pacific Division for the year 1941 to 1942, presented the first evening address, "Progress in Investigations of the Nutrition of Plants."

One of the most enjoyable social events of the week was the organ recital given in the Mormon Tabernacle on Wednesday afternoon by Alexander Schreiner. It was followed by a reception at the Lion House, historic residence of the pioneer leader, Brigham Young.

"Researches in Dendro-Chronology" was the title of the evening address presented by Dr. Andrew E. Douglass, of the University of Arizona, on Wednesday evening.

On Thursday afternoon open house was held in the Geological Museum and Archeological Museum, following which tea was served by the University of Utah Women's Club.

The concluding evening address on "Recent Developments in Photography" was presented on Thursday evening by Dr. C. E. K. Mees, of the Eastman Kodak Company, Rochester, N. Y.

Business sessions of the executive committee and the council of the Pacific Division, American Association for the Advancement of Science, were held during the week. E. O. Essig was elected to fill the unexpired term of T. G. Thompson, who resigned his position on the executive committee. H. U. Sverdrup was elected to the executive committee in succession to F. B. Sumner, retiring from office on completion of five years of service. B. M. Allen and J. F. Kessel were elected as members-at-large on the council for four-year terms, in succession to C. L. Utterback and H. A. Spoehr.

Dr. Linus Pauling, of the California Institute of Technology, was elected to the presidency of the division, in succession to Professor D. R. Hoagland. Professors R. E. Clausen and J. Murray Luck were re-elected vice-president and secretary-treasurer, respectively.

A resolution of gratitude was unanimously adopted for the generous hospitality of the local sponsoring

organizations—the University of Utah, Utah State Agricultural College, Brigham Young University, Weber Junior College and the Utah Academy of Sciences, Arts and Letters. It was announced that the 1943 meeting would be held in Corvallis, Oregon, under the auspices of the Oregon State Agricultural College. Professor R. V. Chamberlin served as chairman of the Committee on Local Arrangements for the Salt Lake City meeting.

### SESSIONS OF AFFILIATED SOCIETIES

The reports of the scientific sessions of participating societies follow.

#### AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS PACIFIC SLOPE BRANCH

(Report by Roy E. Campbell)

The 27th annual meeting of the Pacific Slope Branch of the American Association of Economic Entomologists was very successful, even though the attendance was reduced because of restrictions on travel. As a matter of fact, the lessened attendance seemed to increase the interest and participation in the discussion of papers presented, which reported on a wide variety of entomological projects in different Pacific Slope states.

Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine, gave an outstanding address on "Insect Problems Affecting Food Production." He stressed the importance of the various problems now facing the entomologists in connection with our national efforts to produce sufficient food for ourselves and our allies.

The discussion on the subject, "What can we as entomologists do to be of most service to our country?" was participated in by most of those present and brought out some very interesting viewpoints. It was shown that the entomologist has a place in the armed forces, where his services are really needed in connection with insect problems affecting the health of military units and the protection of food stores. It was also brought out that all our efforts, whether in research, extension or teaching, should be concentrated on the control of insects affecting food and other materials used by the military and civilian forces in connection with the war, and less attention given to purely scientific problems or technical research which can be postponed until after the war.

Two very fine colored motion pictures were shown, one by Dr. A. J. Cox, chief of the Division of Chemistry of the California Department of Agriculture, the subject of which was "The Story of Economic Poisons." This showed the making and application of our various economic poisons. The other motion picture was "Combat," by the General Chemical Com-

pany, showing the fight against insect pests and plant diseases in the principal fruit and vegetable producing areas of the country.

New officers elected were: *Chairman*, Merton C. Lane, Bureau of Entomology and Plant Quarantine, Walla Walla, Washington; *Vice-Chairman*, K. W. Gray, Oregon State College, Corvallis, Oregon; *Secretary-Treasurer*, Roy E. Campbell, Bureau of Entomology and Plant Quarantine, Alhambra, California.

#### AMERICAN ASSOCIATION OF PHYSICS TEACHERS (Report by Orin Tugman)

The American Association of Physics Teachers met on June 17. A paper was presented by Lynn W. Jones, of the University of Redlands, on "Correlations of Force and Field Intensity in Gravitational, Electrical and Magnetic Fields." The author of the paper not being present, the presiding officer of the meeting read the paper from manuscript supply. After discussion, the remaining time was devoted to the Symposium on the Role of the Physics Teacher in War Time. Dr. Willard Gardner, Utah State Agricultural College, Logan, Utah, read a paper on "Physics and Agriculture." This paper was a discussion on the relationships between agricultural food supplies and physics. Dr. Wayne B. Hales, Brigham Young University, Provo, Utah, read a paper on the "Significance of the Increased Demand for Physicists." In the discussion which followed it appeared to be a consensus of opinion that more publicity should be given to the deferment which may be allowed students of physics. It was pointed out that in many cases students are not aware of the proper procedure to secure deferment.

#### AMERICAN METEOROLOGICAL SOCIETY (Report by G. K. Greening)

At the meeting of the American Meteorological Society from June 17 to 19, twenty-three papers were presented on a variety of subjects, divided into the following general groups: (1) Weather maps, forecasting, aeronautical meteorology; (2) agricultural meteorology and climatology; (3) theoretical and engineering meteorology, and (4) hydrology.

A new system for entering meteorological data on the daily weather map was explained by J. M. Lanning, of the Phoenix, Arizona, Weather Bureau Office. It is a three-dimensional system which gives not only length and breadth, but also depth to the weather map, and data relating to wind velocity and direction for various heights above the earth's surface are entered at certain set levels above the map by writing with ordinary ink on glass plates laid horizontally from wooden frames with a light near the bottom.

Thus the use of a number of separate charts is eliminated, and it may be found that data other than that relating to air circulation can be entered on the plates.

Dr. Robert D. Fletcher, instructor in meteorology at the University of California at Los Angeles, discussed "Some Practical Relationships Involving the Vertical Wind Shear," concerning two relationships between the temperature field and change of wind with height. Assuming a geostrophic wind and that the slope of isobaric surfaces is small compared with that of isothermal surfaces, Dr. Fletcher arrived at an equation exactly similar in form to the geostrophic wind equation, but in which the pressure gradient is replaced by the temperature gradient, density by temperature and wind by the vertical wind shear.

Arnold Court, of the Los Angeles Weather Bureau Office, who was with the 1940-41 Byrd Antarctic Expedition, cited various proofs to show that there is no connection between air circulation in the Antarctic and in the rest of the world. Dr. Wayne B. Hales, of the Brigham Young University at Provo, demonstrated air mass movements and interactions by means of a Kodachrome motion picture, showing the movement of colored liquids in a density chamber.

Mathematical formulas from climatological data for determining the beginning and ending of the growing season and for predicting the occurrence of forest fires were explained by George L. McCollm, Soil Conservation Service, Salt Lake City, and H. M. Shank, Forest Service, Ogden, Utah, respectively.

In the hydrology discussions A. R. Croft, of the Ogden Forest Service office, produced evidence indicating that the presence of foreign matter tends to increase the rapidity of snow melt, and J. Cecil Alter, of the Cincinnati Weather Bureau, presented a progress report on his investigation of the necessity for providing precipitation gauges with shields in order to secure an accurate catch.

#### AMERICAN PHYTOPATHOLOGICAL SOCIETY, PACIFIC DIVISION

(Report by C. E. Yarwood)

In the absence of the president and vice-president, the meetings were presided over by B. L. Richards, of the Utah Agricultural College. Twenty-two members were present from Arizona, California, Idaho, Utah, Wyoming, Washington, D. C., and Brazil. The meetings were organized into three sessions, at which sixteen volunteered papers were presented, and one symposium, at which eight invitational papers were presented.

H. S. Fawcett and A. A. Bitancourt discussed the host morphology and orchard distribution of the psorosis virus disease of citrus. C. W. Bennett re-

ported that curly top virus would live up to seven years in dried host tissues. W. G. Solheim found that certain natural illuminating gases found in Wyoming were relatively non-toxic to green plants. L. C. Cochran reported that peach trees affected with certain viruses tend to recover after the first acute symptoms of the disease. E. C. Blodgett described Coryneum blight on several stone fruits. Eubanks Carsner found that high temperatures could limit the occurrence of sugar beet downy mildew. W. J. Virgin reported that some storage diseases of carrots could be reduced by starting the storage period during the cool weather. B. Dundas found that lima bean powdery mildew is apparently caused by a *Microsphaera* and not by an *Erysiphe*. V. P. Sokoloff reported attempts to control citrus red scale by means of a soil bacillus. P. A. Ark reported control of crown gall by seed treatment, and described an important bacterial scab of carrot roots. Catherine Roberts showed the morphological similarity between *Taphrina* and *Torulopsis*. Dean Pryor found that big vein of lettuce could develop over a wide range of controlled soil moisture levels. C. E. Yarwood reported that hop downy mildew was reduced by using string supports treated with bordeaux.

At the symposium on "Breeding for Resistance to Plant Diseases," organized by H. Loran Blood, breeding onions for resistance to downy mildew, pink root and thrips was discussed by G. N. Davis; the development of powdery mildew-resistant cantaloupes was reported by Dean Pryor; curly top-resistant beans were reported by W. J. Virgin; mosaic-resistant beans were discussed by M. E. Anderson; breeding snap beans for resistance to powdery mildew and rust was discussed by B. Dundas; the performance of curly top-resistant sugar beets was reported by F. V. Owen, and limitations in the control of peach viruses by breeding was discussed by L. C. Cochran.

At the dinner meeting, B. L. Richards reported studies of the Western X disease of stone fruits.

Officers for the coming year are: *President*, L. D. Leach, University of California, Davis; *Vice-President*, B. L. Richards, Utah Agricultural College, Logan; *Secretary-Treasurer*, C. E. Yarwood, University of California, Berkeley; and *Councilor*, Glenn A. Huber, Washington Agricultural Experiment Station, Puyallup.

#### AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE

(Report by John H. MacGillivray)

Horticulture was represented on the "Breeding for Resistance to Plant Diseases" symposium by Glen N. Davis, who discussed onions, and D. E. Pryor and T. W. Whitaker, who outlined the progress in developing powdery mildew resistance in cantaloupes. Re-

search has been progressing on both of these cooperative projects for over ten years. In both cases significant contributions of economic value have been made to our vegetable industry.

W. W. Aldrich gave the annual address at the Horticulturists dinner on "Irrigation in Horticulture To-day." Dr. Aldrich summarized our present knowledge on this subject based on experimental evidence and observations on a wide range of horticultural plants, climatic and soil conditions. He discussed these data from the standpoint of methods which may be used to determine when horticultural plants should be irrigated.

G. C. Hanna presented evidence that ten year yields on asparagus are better for determining the yielding ability of parent plants than shorter periods in a breeding program. Crown characteristics at time of planting failed to give evidence of future yielding ability. G. A. L. Mehlquist gave the necessary scientific background for the production of *Primula obconica* seed which can not be imported at the present time. H. E. Hayward and E. M. Long presented evidence that Elberta peaches gave different growth responses when grown on Lowell and Shalil rootstocks in high chloride and/or sulfate solutions. Roy W. Nixon reported on the effect of thinning treatments on the amount of "shrivel" in the Halway date. Light, medium and heavy pruning on the top regeneration of the Valencia orange was discussed by S. H. Cameron and R. W. Hodgson.

#### AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS, WESTERN DIVISION

(Report by Richard S. Croker)

The meetings of the Western Division, American Society of Ichthyologists and Herpetologists, consisted of two symposia, a round table discussion and a half-day session of general papers. The high light of the meetings was the symposium entitled "The Great Basin with Emphasis on Glacial and Post-Glacial Times," which was arranged jointly by the society and the American Association for the Advancement of Science. Eliot Blackwelder spoke on the geological background, describing the evolution of the Great Basin and its surrounding mountains. Carl L. Hubbs, presenting a paper prepared jointly with Robert R. Miller, showed that the present distribution of fishes in isolated parts of the Great Basin substantiates the assertions of geologists regarding the history of this area. Ernst Antevs discussed the changes in climate of this area and how they affected the ancient inhabitants, as well as how the study of former inhabited sites indicates early climatic conditions.

The second symposium, "Problems of Management

of Trout Waters," emphasized conditions in the Inter-Mountain Region. Marion J. Madsen spoke on the objectives of management, chief of which is to "provide satisfactory fishing for the largest number of anglers at the most reasonable cost." James W. Moffett discussed environment and management, with emphasis on the fact that each body of water is a separate problem and that neither the general survey nor the intensive study is the sole approach. James R. Simon spoke on administrative considerations in the methods of management. He stated that "hatcheries still have a place in trout management but that the exaggerated claims for their success must be revised in view of the efficiency of natural reproduction."

A round table discussion on reptiles, "Seasonal Behavior Patterns," was led by A. M. Woodbury.

The points discussed included the effects of temperature, humidity, light and other factors on such habits as denning and solitary hibernation, feeding, migration, breeding, etc.

Papers read at the general session included those on fish pigment by F. B. Sumner, fossil fish scales by L. R. David, proportion of scale length to fish length by L. D. Townsend and H. L. Connor, aboriginal use of fisheries by G. W. Hewes and the shark fishery by R. S. Croker.

Officers of the Western Division of the society for the ensuing year are: *President*, W. C. T. Herre, Stanford University; *Vice-President*, Raymond B. Cowles, University of California, Los Angeles; *Secretary*, Richard S. Croker, California Division of Fish and Game, Terminal Island, California.

(To be concluded)

## THE RESOURCES OF THE CONTINENTS<sup>1</sup>

By Dr. KIRTLEY F. MATHER

PROFESSOR OF GEOLOGY, HARVARD UNIVERSITY

ANY consideration of the changes that are likely to occur during the next few years in the social and political life of man must include the inescapable fact that the demands upon mineral resources are certain to increase. Not only in war but also in peace, human efficiency and comfort are increasingly dependent upon metallic ores, mineral fuels and the products of the ground. No matter what may be the nature of the new order for which men fight and plan and work, it can become a reality only if it is adjusted both to the peculiarities of human nature and to the characteristics of the physical resources available in this terrestrial environment. It is worth while, therefore, for all concerned with the fate of man to give careful thought to the nature and distribution of the raw materials with which Mother Earth's storehouse is stocked.

These basic requisites for modern civilization occur under certain well-defined geological conditions. Their distribution is by no means haphazard or unpredictable. Now that the general geological structure of all the continents is known and the specific occurrence of many valuable mineral deposits has been studied, it is possible to estimate with some degree of accuracy the total stores of the more important metals, fuels and other minerals that are available for human use, and to compare the relative wealth of the several continents with regard to mineral resources.

It may help in making such a survey to group the

rocks of the earth's crust in three categories. First there are the very old, and generally much contorted or compressed rocks of the Basement Complex or Pre-Cambrian terrane. These include vast bodies of granite and other igneous rocks, many of them intensely metamorphosed, as well as sedimentary rocks that likewise have been greatly altered by heat and pressure during the many vicissitudes of crustal movement and volcanic eruption that have affected them throughout the long ages of subsequent geologic time. These ancient rocks contain many rich bodies of metallic ores, such as those yielding gold, silver, copper, nickel and iron. Nowhere do they contain coal, petroleum or the ores of such metals as aluminum and magnesium.

There are extensive areas of Pre-Cambrian rocks in every continent, and no large unit of these rocks has thus far failed, when adequately prospected, to be the source of essential metals. The Canadian Shield surrounding Hudson Bay in North America is matched by the Scandinavian Shield of northwestern Europe and the Angara Shield of north-central Siberia in Asia. In the southern hemisphere, the Brazilian Shield of South America is matched by the extensive bodies of Pre-Cambrian rock in south and central Africa and the Basement Complex of Australia.

The second group of rocks in this very loose classification of mine includes the sedimentary formations of Cambrian and post-Cambrian age. These may be flat-lying beds beneath the plains and in the plateaus or they may be wrinkled into mountains like the

<sup>1</sup> World-wide broadcast of the American Philosophical Society and WRUL, Philadelphia, July 17, 1942.

Appalachians. It is from these that the world's resources of coal and petroleum are secured, as well as much of the potash and magnesium and some of the iron and non-ferrous metals. Here too it should be noted that every continent has its share. The widespread basin of the Mississippi Valley in North America is matched by the extensive area of sedimentary rocks in central Europe between the Alps and the Scandinavian highlands. The vast lowland of the Amazon in South America finds its structural counterpart in the interior basin of Australia and the broad plains of north central Asia.

The third major type of geologic structure is that resulting from and associated with volcanic activity. Here the geologist has in mind not only the outpoured lavas and erupted cinders, ash and bombs of volcanic cones and plateaus. He thinks also of the intruded masses of igneous rock that crystallized in the conduits leading to the volcanic vents, or spread out in sheets or dome-shaped bodies in the upper part of the earth's crust without ever actually breaking through to the surface. It is in association with such rocks, especially those of Tertiary age, that some of the world's most important reserves of precious metals, of copper, lead and zinc, and of such metals as tungsten, vanadium, molybdenum and manganese, essential in the production of modern steel alloys, are found. Here, again, we observe that nature plays no favorites, so far as continents are concerned. The volcanic terranes of North America's western mountains have their equivalent in the Andes of South America, the festooned arcs of many a mountain system in eastern and southern Asia, the plateaus and cones of central Africa.

The fact is that every continent displays almost the entire gamut of possible geologic structures and therefore may be expected to contain extensive deposits of almost every kind of mineral resource useful to-day or likely to be useful in the future as a raw material of industry. Although the United States alone has thus far produced more than two thirds of the world's entire production of petroleum, this is because Americans have been more successful than any other people in finding and using this type of fuel. There is no chance that a century ago two thirds of the world's supply of petroleum was concentrated beneath the surface of the United States. On the contrary, with the exception of Australia, every continent probably contains petroleum reserves proportional to the entire total of the world's supply, as the area of each continent is proportional to the total land of the earth.

Similarly, the fact that, to date, Continental Europe, the United States, Great Britain and Russia have produced over 80 per cent. of the world's steel

does not mean that the rest of the world contains only 20 per cent. of the earth's ores of iron. Instead it means that the inhabitants of the regions first mentioned have been most ingenious and efficient in discovering and utilizing the iron ore deposits that they possessed. The iron ores of Asia, Africa, Australia and South America for the most part await future development.

In other words, for the overwhelming majority of basically important minerals, each continent may be expected to have domestic sources, adequate when properly developed, to supply most of the needs of its inhabitants when the standards of living and the way of life everywhere attain the characteristics of modern industrial civilization. Mother Earth provides equality of opportunity; it is man that differs in responding to opportunity.

But this is not to say that nature favors continental isolation or regional self-sufficiency as the pattern for world organization. There are several significant exceptions to this glittering generality of equalized distribution of mineral wealth, continent by continent. Even when we remember that, for many purposes, molybdenum may be substituted for tungsten, coal for petroleum, and magnesium for aluminum, we find that at present and probably for a long time in the future, the inhabitants of no continent and therefore of no one country can "live to themselves alone," without sacrificing many of the benefits of modern civilization.

Outstanding among these exceptions is tin. Nature has played a strange trick in making tin ores scarce in the highly industrialized regions where the tin can is an essential item. There are practically no ores of tin in all North America, and the puny deposits of that metal in all Europe are competent to meet only 5 per cent. of the needs of Europeans.

Much the same can be said about the ores of nickel and of radium. These are found in only a few rare localities in only two or three of the six continents.

Even this hasty survey of the resources of the continents therefore leads us unerringly to the conclusion that if man is to make full use of the available mineral wealth, his social, economic and political organization must be on a planetary rather than a continental basis. Each continent has sufficient stores of raw materials to give it a place of equality with every other continent. From the geological point of view there is no basis for rating any continent as inferior to any other. But no continent can provide sufficient amounts of every ingredient of modern civilization to satisfy the needs of man. Only as each contributes freely and without hindrance to the welfare of all mankind can the resources of any be utilized to the best advantage.

The geologist can not escape the conclusion that the

earth is far better adapted for occupation by men organized on a world-wide scale with maximum opportunity for free interchange of raw materials and

finished products the world around, than for occupation by men who insist upon building barriers between regions even so large as entire continents.

## OBITUARY

### WILLIAM JOHN PETERS

THE death of Captain William John Peters on July 10 removed from American geophysics an outstanding scholar and investigator whose unselfish achievements in the field and laboratory are internationally recognized. He took part in almost every phase of research in earth physics and in quest of data he covered a large part of the earth's surface. Preeminent in his contributions was the geomagnetic work at sea and for which he invented and improved instruments making for more rapid and more accurate determinations.

Captain Peters was born in Oakland, California, on February 5, 1863, and was educated in the public schools there. After a short time as a student at the University of California, he was appointed as observer and computer on a survey of the boundary between two western states; in this work he gave much study to methods of astronomical determination not frequently used.

His important professional life began with appointment as assistant topographer in the U. S. Geological Survey in 1884. His advance through various grades was rapid. For several years he was engaged in geodetic work in the western states. During 1898-1901, as chief of party, he successfully completed difficult and important exploration in Alaska for the Survey and again during 1902 in Utah and Alaska.

This extensive experience, much of it in polar regions, fully qualified him for appointment as chief scientist and second in command of the Ziegler Polar Expedition of 1903-1905. Despite unusually severe meteorological and ice conditions, coupled with the loss of the expedition's vessel, Captain Peters succeeded in obtaining valuable 11-month series of geomagnetic data at Teplitz Bay, Rudolph Island, Franz Josef Archipelago, along with other material at Teplitz Bay, Cape Flora, and Alger Island, on aurora, meteorology, tides, geomagnetism, astronomy and map construction and surveys. In this his organizing ability and training of those associated with him were paramount factors. The extensive and detailed accounts of this work and of the resultant valuable geophysical data and discussions were published by the National Geographic Society in 1907 in a 630-page quarto volume entitled "The Ziegler Polar Expedition, 1903-1905: Scientific Results." The fact that the entire burden of the scientific program, except for only occasional assistance by other members of the expedition, was

carried by Captain Peters and four assistants, makes this really a marked achievement in the history of polar exploration. Commander Anthony Fiala, of the expedition, regarded the amount of scientific work accomplished in the scant time available as "sufficient evidence of the indefatigable and persistent prosecution of the observations on the part of the scientific party."

Shortly after the return of the expedition, Captain Peters was appointed as chief magnetic observer and commander of the *Galilee* for the Department of Terrestrial Magnetism of the Carnegie Institution of Washington on her second and third cruises of over 52,000 miles in the Pacific Ocean and thus entered upon his second major service to geophysics. While on the *Galilee*, whenever possible, he experimented with the object of improving instruments and methods of magnetic observations at sea. As a result he developed the marine collimating-compass, which was destined to become the standard instrument for determining the magnetic declination on board the *Carnegie*.

As the result of the work done on the *Galilee* the special non-magnetic vessel *Carnegie* was designed along lines largely suggested by Captain Peters. He superintended her construction and commanded her first two cruises of over 100,000 miles, the second of which extended around the world with a total length of 92,829 nautical miles in 798 days. Important corrections to geomagnetic charts were found on this second cruise, particularly in the Pacific and Indian oceans. The detailed results and discussions obtained were published by the Carnegie Institution of Washington as the third volume in the series "Researches of the Department of Terrestrial Magnetism." These constitute a lasting memorial to the long labors and scientific genius of Captain Peters.

In 1914 Peters secured observations along the coasts of Labrador, Hudson Bay and Hudson Strait as well as at sea in Hudson Bay. Here again most valuable geophysical data were obtained despite unusual difficulties of season and navigation in the small three-masted schooner *George B. Cluett*.

Upon completion of the work in Hudson Bay, Captain Peters entered upon his third major service to geophysics in the direction at the Department of Terrestrial Magnetism of the compilations and discussions of the accumulated results at sea, the oversight of the continuing surveys at sea by the *Carnegie*, and the

investigation of fundamental problems of compass design, compensation and dynamic deviation, which continued until his retirement from active duty, June 30, 1934. A large part of the progress made in the investigations of the Department of Terrestrial Magnetism in its fields must be credited to Captain Peters in these twenty years of his professional life.

When the British Admiralty decided in 1935 to build a non-magnetic vessel—*Research*—to carry forward the geomagnetic survey at sea previously done by the *Carnegie*, that organization invited the Carnegie Institution of Washington to make available as an expert consultant the services of Captain Peters to aid in the vessel's design and in her instrumental equipment. Nothing illustrates so well the selfless interest and enthusiasm as his acceptance of this responsibility and the sacrifice of a year of his well-earned privilege of retirement. Arriving in England in the fall of 1935, as a representative of the Carnegie Institution of Washington, he took active part for over a year in the design of the new vessel and of her equipment—tasks for which his unique experience so peculiarly fitted him. The Admiralty took occasion to record its high appreciation of this valuable aid which had done so much to make possible the later launching of the *Research*. She was rapidly being equipped for her first cruise to Washington, D. C., and thence through the South Atlantic into the Indian Ocean, when the outbreak of the war in 1939 made it necessary to postpone her work.

Following his work in England and service as a delegate of the United States at the triennial Assembly of the International Union of Geodesy and Geophysics in Edinburgh in 1936, Captain Peters continued to devote much of his leisure time to scholarly studies. Many were the calls upon him as a recognized authority in polar exploration and nautical science. One of his last studies involved an investigation of the log of the cruise of Ponce de León and discussions bearing on his route to and landfall near St. Augustine, Florida.

Some 50 volumes and publications evidence the extent of Peters' scientific activities. These show not only a mind trained by practical experience but also one unusually skilled in higher mathematics and the

exact sciences—acquired only by persistent study in each new field or problem as it was presented—and in their useful applications.

Captain Peters died at his home in Chevy Chase, Maryland, on July 10, 1942. He is survived by his widow, Beatrice Speaight Boyd Peters, and his son, Geoffrey Lloyd Peters.

All who had the privilege of acquaintance and friendship with Captain Peters unite in estimating him as a thoroughly modest gentleman and capable experimenter and investigator. All who served with him in any capacity unite in praise of his sympathetic unselfish guidance to attainment in their activities. His share in the edifice of geophysical science is a solid foundation for future building.

JNO. A. FLEMING

DEPARTMENT OF TERRESTRIAL MAGNETISM,  
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## DEATHS AND MEMORIALS

MAURICE L. CARR, director of research of the Pittsburgh Testing Laboratory, died on July 13 at the age of sixty-five years.

DR. WILLARD A. ROBERTS, of the department of research lamp development at the Nela Park branch of the General Electric Company, died on July 24 at the age of fifty-two years.

SIR WILLIAM MATTHEW FLINDERS PETRIE, the British archeologist, died in Jerusalem on July 28. He was eighty-nine years old.

SIR DANIEL HALL, F.R.S., who was director of the Rothamsted Experimental Station from 1902 to 1912, died on July 5, at the age of seventy-eight years.

DR. RICHARD WILLSTAETTER, formerly professor at Munich and Berlin, Nobel laureate in chemistry, died in Switzerland on August 2. He would have celebrated his seventieth birthday on August 13.

THE recently completed two-story brick building on the grounds of the Connecticut Agricultural Experiment Station, New Haven, will be named the Britton Laboratory, in memory of Dr. Wilton Everett Britton. Dr. Britton, until his death in 1939, was for about forty years entomologist of the Experiment Station and state entomologist.

## SCIENTIFIC EVENTS

### THE ENDOWMENT OF AN INSTITUTE OF SOCIAL MEDICINE AT OXFORD

THE Nuffield Provincial Hospitals Trust, with the approval of Lord Nuffield, will, according to the *Times*, London, devote £10,000 a year for ten years to the creation at the University of Oxford of a university professorship of social medicine and the foun-

dation of an institute in which the professor will work. The purposes of the institute are:

To investigate the influence of social, genetic, environmental and domestic factors on the incidence of human disease and disability.

To seek and promote measures, other than those usually employed in the practice of remedial medicine, for the

protection of the individual and of the community against such forces as interfere with the full development and maintenance of man's mental and physical capacity.

If required by the university to do so, to make provision in the institute for the instruction in social medicine of students and practitioners of medicine approved by the board of the faculty of medicine in the University of Oxford.

There will be an administrative committee for the institute on which the trust will be represented by six members. In this way cooperation will be furthered between the institute and other research institutions established elsewhere by the trust.

Six years ago Lord Nuffield devoted £2,000,000, augmented later by gifts for special purposes of more than £600,000, to the endowment of medical research in the University of Oxford, believing that in a great university medical research would get inspiration and help from its contact with other studies of all kinds. In December, 1939, he endowed the Nuffield Provincial Hospitals Trust, of which W. M. Goodenough, who is chairman of the trust connected with medical endowment at Oxford University, is also the chairman. This trust is empowered to spend money on a wide range of purposes which can be of benefit to the hospital services.

#### FINANCES OF THE JOHNS HOPKINS UNIVERSITY, 1936-1942

THE following account was given in *The Johns Hopkins University Gazette* of the finances of the university:

The 1936 sustaining fund was launched to meet the operating deficits, principally of the Homewood divisions of the university, which had in 1935 mounted to nearly \$200,000 annually.

This appeal embraced two main objectives: first, to provide a sustaining fund of \$750,000 to maintain operations on a satisfactory level for a three-year period; and second, to secure additional capital funds of \$10,000,000 needed to insure stability and to continue the normal functions of a first-class university.

Subscriptions to the sustaining fund amounted to \$560,000. This sum has met the operating deficits at Homewood during the seven intervening years, instead of the three years originally contemplated. In the meantime, the university fulfilled its promise to reduce expenses to a bare minimum. The annual deficit of \$177,000 in 1936 has been reduced to approximately \$34,000 in 1940-41.

Meanwhile, progress has been made on the second objective of the 1936 appeal through gifts and bequests to the university of nearly \$4,000,000. The chief items making up this total are:

Estate of James Swan Frick .....	\$324,000
Estate of Louis J. Boury .....	955,000

Gift of Henry Strong Denison Medical Foundation .....	100,000
Rockefeller Foundation for Preventive Medicine .....	350,000
Rockefeller Foundation for Biological Sciences .....	500,000
Estate of John Martin Vincent .....	945,000
Estate of Alfred Jenkins Shriver .....	158,943 <sup>1</sup>

While these amounts have been received, because of restrictions imposed they are not entirely available for endowment funds. Neither the School of Medicine nor the School of Hygiene and Public Health was included in the appeal in 1936 for sustaining funds. The endowment of the School of Hygiene, restricted to its use, is sufficient at this time to care for the needs of the school.

Expenses of the School of Medicine, however, have increased materially, causing an annual deficit in 1936 of \$5,089.31, mounting to \$52,336.82 in the year just passed. These deficits have been met up to the present time by the expenditure of unrestricted funds available for such purpose. The chief item of increase has been in instruction and departmental research where expenditures from general funds have increased about \$46,700; operation and maintenance of physical plant has at the same time increased approximately \$7,900.

#### THE KING OF ENGLAND'S BIRTHDAY HONORS LIST

THE following names of scientific men and others associated with scientific work appear in the King's Birthday Honors list, printed in *Nature*:

*O.M.*: Dr. E. D. Adrian, professor of physiology in the University of Cambridge.

*Baron*: J. M. Keynes, the distinguished economist.

*K.C.M.G.*: Sir Guy Marshall, director of the Imperial Institute of Entomology.

*K.B.E.*: Dr. C. G. Darwin, director of the National Physical Laboratory.

*Knights*: Dr. R. H. Fowler, Plummer professor of mathematical physics in the University of Cambridge, lately liaison officer in North America; Dr. W. H. Fyfe, principal and vice-chancellor of the University of Aberdeen; H. Gaskell, a director of Imperial Chemical Industries, Ltd.; W. Gavin, chief agricultural adviser, Ministry of Agriculture; L. Mason, deputy director-general of supply, India, and lately inspector-general of forests; Professor W. F. Shaw, president of the Royal College of Obstetricians and Gynecologists; Major-General J. Taylor, I.M.S., director of the Central Research Institute, Kasauli; R. A. Watson Watt, scientific adviser on telecommunications, Ministry of Aircraft Production.

<sup>1</sup> Actually received from a bequest approximating one million dollars.

*C.B.:* Dr. H. J. Gough, deputy controller-general of research and development, Ministry of Supply.

*C.M.G.:* Dr. D. B. Blacklock, professor of tropical hygiene, University of Liverpool; G. F. Clay, director of agriculture, Uganda; Dr. A. F. Mahaffy, director of the Yellow Fever Research Institute, Uganda.

*C.I.E.:* W. T. Hall, chief conservator of forests, United Provinces; C. M. Harlow, chief conservator of forests, Central Provinces and Berar; Colonel E. A. Glennie, director of the Survey of India; Lieutenant-Colonel G. R. McRobert, professor of medicine, Medical College, Madras; Dr. L. E. Napier, director of the School of Tropical Medicine, Calcutta; Lieutenant-Colonel E. McK. Taylor, director of the Irrigation Research Institute, Punjab.

*C.B.E.:* G. E. Bodkin, director of agriculture and principal of the College of Agriculture, Mauritius; Dr. E. A. Carmichael, director of the Neurological Research Unit of the Medical Research Council, National Hospital for Nervous Diseases; Dr. T. J. Mackie, professor of bacteriology, University of Edinburgh; F. J. Mortimer, lately president of the Royal Photographic Society; Professor A. C. Norman, director of the X-Ray Institute in Iraq and professor of radiology in the Royal College of Medicine, Bagdad; Dr. Z. F. Willis, general secretary of the Y.M.C.A.

*O.B.E.:* V. A. Beckley, senior agricultural chemist, Kenya; E. G. Bowen, senior scientific officer, Ministry of Aircraft Production; Dr. H. J. O'D. Burk-Gaffney, senior pathologist, Tanganyika; S. Butterworth, principal scientific officer, Admiralty; T. G. Henderson, principal veterinary officer, Basutoland; G. D. A. Macdougall, chief assistant, Statistical Branch, Prime Minister's Office; A. Monro, chief veterinary officer, Ministry of Agriculture; Dr. B. Prasad, director of the Zoological Survey of India; A. H. Stein, divisional forest officer, Hoshangabad, India; C. B. Symes, medical entomologist, Kenya; A. F. Thelwell, secretary of the Jamaica Agricultural Society; A. F. Wilkins, principal scientific officer, Ministry of Aircraft Production; H. Wooldridge, senior scientific officer, Department of Scientific and Industrial Research.

*M.B.E.:* Canon L. A. Lennon, for services to education and agriculture, in Nigeria; G. W. Lines, agricultural officer, Nigeria; R. E. Mills, technical assistant, Ministry of Aircraft Production; H. C. Mundell, agricultural and livestock officer, Basutoland; Miss K. M. Shaw, personal assistant to the dean of the London School of Hygiene and Tropical Medicine; L. B. Turner, deputy assistant director, Explosives Department, Ministry of Supply; J. J. Unwin, scientific officer, Ministry of Aircraft Production.

*I.S.O.:* G. D. Goode, chief clerk, Department of Science and Agriculture, and personal secretary to the Director of Agriculture, Jamaica.

#### DR. ALEŠ HRDLIČKA<sup>1</sup>

THE retirement of Dr. Aleš Hrdlička from the curatorship of the Division of Physical Anthropology in the National Museum, Washington, which he has held for almost forty years, is an event which no scientific journal can leave unnoted. Under him there has grown up in the National Museum one of the greatest—if not the greatest—collections of anthropological material in all the world; he is founder and leader of the enterprising school of physical anthropology which now flourishes in the United States. Born in Czecho-Slovakia in 1869, he was still a youth when his family emigrated to the United States; there he became a student of medicine, and it was through the medical portal he entered upon the anthropological problems of the human body. On the anniversary of his seventieth birthday a list of his contributions to anthropology was compiled; they are now more than three hundred in number, covering every aspect of his subject, every one of them making a factual addition to a particular department of knowledge.

Dr. Hrdlička is beyond doubt the most traveled anthropologist of his time; there is no part of the world he has not visited in search of material and of knowledge. He made the circuit of the world several times to examine and report on the fossil remains of early man. His reports, issued from time to time in the publications of the Smithsonian Institution, are recognized throughout the world as the most reliable sources of fact relating to the discoveries of fossil man. His studies on the Old Americans (men and women of British ancestry), of the American Indians and of the Negro population of the United States have become classics. He has sought to trace the first peopling of the New World from a Mongolian homeland in northeast Asia and has explored Alaska for evidence of early migrations. In Alaska, too, he has dug up cemeteries attached to older Eskimo settlements; he has added greatly to our knowledge of the Eskimo, both ancient and modern. Dr. Hrdlička made warm friends wherever he went, particularly in England. He lectured in London in 1939 while on his way to the U.S.S.R. to examine the various finds of fossil man which have been made there in recent years. In 1926 his Czech colleagues issued a "Hrdlička" number of *Anthropologia* in honor of their distinguished countryman. At the close of the War of 1914-18 he founded the *American Journal of Physical Anthropology*, now the leading publication of its kind.

<sup>1</sup> From *Nature*.

### RESEARCH GRANTS OF THE WISCONSIN ALUMNI RESEARCH FOUNDATION

FIFTEEN gifts and grants, the largest a \$60,000 research allotment from the Wisconsin Alumni Research Foundation, have been accepted by the Board of Regents of the University of Wisconsin. The gifts amount to \$89,054, and are largely for research in chemical, agricultural and medical fields or for student loans and scholarships.

The foundation also allotted \$4,000 for a research fellowship in the department of pediatrics for 1942-43, to be supervised by Dr. J. E. Gonce.

Other gifts and grants were:

Commercial Solvents Corporation, Terre Haute, Ind., \$1,250 to renew an industrial fellowship in biochemistry.

Wisconsin Canners Association, Madison, \$300 to establish an industrial fellowship for studies on sweet corn.

Lakeshire-Marty Co., Plymouth, Wis., \$600 to establish an industrial fellowship for the study of factors involved in the manufacture of cheese.

National Cheese Institute, Chicago, \$1,235 additional grant for studies on cheese and other dairy products.

Heyden Chemical Corporation, Garfield, N. J., \$2,200 to establish an industrial fellowship in agricultural bacteriology and biochemistry.

Carnegie-Illinois Steel Corporation, Pittsburgh, \$1,125 addition to industrial research fellowship for studies of dairy barns.

Parke, Davis and Company, Detroit, \$2,000 for continuation of research on malaria in the department of pharmacology.

Nutrition Foundation, New York City, \$6,000 for vitamin studies, a study of the relation of dental caries in the monkey and a study of biotin metabolism.

W. K. Kellogg Foundation, Battle Creek, Mich., \$4,000 for loans or scholarships in the School of Nursing.

Wisconsin Alumnae Club, Minneapolis, \$100 contribution to the Henrietta Wood Kessenich loan fund.

Hoberg Paper Mills, Inc., Green Bay, \$250 for publication of the *Journal of Land and Public Utility Economics*.

International Harvester Company, Chicago, \$500 for

publication of the *Journal of Land and Public Utility Economics*.

Subscriptions to the Pro Arte fund, \$2,194.

### LOUISIANA STATE UNIVERSITY UNIT OF THE MILITARY GENERAL HOSPITAL

THE Louisiana State University Unit, Military General Hospital Number 64, was mobilized by the Army of the United States for active war duty on July 15. The unit is composed of fifty-five physicians and dentists, 105 nurses and a large number of civilian specialists. It is organized to care for 1,000 patients in a base hospital and will be assigned to foreign duty. The unit will undergo a period of training in military hospital routine at one of the Army posts in the United States before being assigned to active service with a combat force.

The medical and nursing staff will be supplemented by the addition of some 500 enlisted personnel. All medical members of the unit hold positions on the faculty of the Louisiana State University School of Medicine.

Many members of the group were already on active duty and many others had applied for immediate active duty and were awaiting assignment when the call for mobilization of the unit was received. These members joined the unit at the port of mobilization.

The unit was organized during the summer of 1940 by Dr. Urban Maes, director of the department of surgery of the School of Medicine, who was in charge of the surgical section of Base Hospital No. 24 during World War I and who served in France.

From the time its organization was completed until its mobilization, the unit was directed by Lieutenant-Colonel Ben R. Heninger, clinical professor of medicine. On mobilization, Colonel Daniel B. Faust, of the regular Army Medical Corps, was assigned to command the unit. Lieutenant-Colonel Heninger is chief of the medical section, and Lieutenant-Colonel Charles J. Miangolarra, clinical assistant professor of surgery, is the chief of the surgical section.

## SCIENTIFIC NOTES AND NEWS

SIR HENRY DALE, president of the Royal Society, has been appointed chairman of the Science Committee of the British Council. He succeeds the late Sir William Bragg.

THE Royal Geographical Society has awarded the Founder's Medal to Miss Freya Stark for her travels in the East, the Patron's Medal to Owen Lattimore for his travels and studies in Central Asia, and the Victoria Medal to Dr. Harold Jeffreys for his researches on the physics of the earth.

THE Sociedad Mexicana de Historia Natural held a meeting at Mexico City on July 24 to receive as an

honorary member Dr. Ernest Carroll Faust, professor of parasitology and acting head of the department of tropical medicine at Tulane University. He was presented by Professor Enrique Beltrán, permanent secretary of the society, and his diploma was given to him by Dr. Rodolfo Brito Foucher, president of the National University of Mexico, who presided. Professor Faust gave an address entitled "Experiences and Reminiscences of an American Medical Parasitologist."

It is stated in the *Journal* of the American Medical Association that Miss Grace Louise Ivanhoe, El Cer-

rito, who recently completed work in parasitology and tropical medicine at the School of Medicine of Tulane University of Louisiana, has been awarded the Geiger Medal for a thesis in the field of public health and sanitation. The Geiger Medal has for a number of years been presented to a graduate student on a public health problem of interest to the Southern states or countries contiguous to these states. The thesis was chiefly concerned with amebiasis.

THE doctorate of science has been conferred by the University of London on Dr. Frank Dickens, of the Imperial College of Science and Technology; on Charles Potter, of the Imperial College of Science, and on E. E. L. Dixon and C. E. Lucas, external students.

THE officers of the American Society of Plant Physiologists for the coming year, 1942-43, are: *President*, W. E. Loomis, Ames, Iowa; *Vice-president*, D. B. Anderson, Raleigh, N. C.; *Secretary-Treasurer*, P. J. Kramer, Durham, N. C.

At the nineteenth annual meeting of the Long Island Biological Association, held at the Biological Laboratory, Cold Spring Harbor, on July 28, Dr. Robert Cushman Murphy, chairman of the department of birds of the American Museum of Natural History, was reelected president of the association.

DR. JAMES P. TOLLMAN, associate professor of clinical pathology at the College of Medicine of the University of Nebraska, has been appointed assistant dean.

DR. GERALD D. TIMMONS, formerly dean of the School of Dentistry at the University of Indiana and executive secretary of the American Dental Association, will succeed the late Dr. I. Norman Broomell as dean of the School of Dentistry at Temple University.

DR. DAVID W. E. BAIRD, JR., associate dean and associate clinical professor of medicine at the University of Oregon Medical School, Portland, has been appointed acting dean of the school during the absence of Dr. Richard B. Dillehunt, who for reasons of health has leave of absence.

DR. P. ARNE HANSEN, assistant curator of the American Type Culture Collection, has been appointed associate professor in bacteriology at the University of Maryland.

DR. EUGENE CHAN has been appointed visiting professor of ophthalmology at the Central University College of Medicine, China. During the last few years he has held the chair of ophthalmology at the West China University and has been head of the Department of Ophthalmology of the Chengtu Eye, Ear, Nose and Throat Hospital. Formerly he was a mem-

ber of the Wilmer Ophthalmological Institute of the Johns Hopkins University.

DR. LUCIUS W. ELDER has been appointed director of the section of physical chemistry at the Central Research Laboratories of General Foods Corporation. Dr. Elder has been engaged in research work with the corporation since 1932.

DR. C. CARROLL SMITH recently retired as dental director of the Peoria, Ill., public schools after serving for twenty-four years.

DR. CARL OLSON, JR., research professor of veterinary science at the Massachusetts State College at Amherst, will report for active duty with the U. S. Veterinary Corps Reserve with the rank of captain. He has been granted leave of absence to serve for the duration of the war.

THE Westinghouse Electric and Manufacturing Company founded in 1939 at Mellon Institute an industrial fellowship to conduct investigational work on plastics, especially synthetic resins, for constructional purposes. Since then the fellowship staff has been carrying on research on new raw materials, new molded products and new processing methods, evaluating them for commercial application. In these activities particular emphasis has been placed on the employment of plastics in those fields where the uses of resinous materials are unknown, limited or undeveloped. Following the completion of this basic research program, two specialists, H. Ross Strohecker and William B. Johnston, will conduct the subsequent investigational and developmental work. Mr. Strohecker will give attention to the physical technology involved and Mr. Johnston will perfect the chemical processing included in the comprehensive project. They will have the direct and constant cooperation of experts in the Westinghouse organization.

PROFESSOR ROGER J. WILLIAMS, of the department of chemistry of the University of Texas, presented a series of four lectures, from July 21 to 24, under the auspices of the department of biological chemistry and the summer session at the University of Michigan. His lectures were concerned with the vitamin B complex.

THE annual meeting of the Corporation of the Marine Biological Laboratory will be held in the auditorium of the laboratory at Woods Hole, Mass., on Tuesday, August 11, at 11:30 A.M., for the election of officers and trustees and the transaction of such business as may come before the meeting.

THE American Roentgen Ray Society will hold its annual meeting at Chicago with headquarters at the Palmer House. Haddon Hall, Atlantic City, where

it was originally planned to meet, has been taken over by the Government.

THE twenty-second annual meeting of the Highway Research Board will be held on December 2, 3 and 4 at the Hotel Statler, St. Louis. It is expected that time and travel facilities will be conserved by holding this meeting immediately before that of the American Association of State Highway Officials, which occurs in St. Louis the following week.

THE American Dietetic Association will hold its twenty-fifth annual meeting at the Hotel Statler, Detroit, from October 19 to 22. All the sessions are planned to provide the dietitian with aid under the circumstances imposed by the war. Plans for increasing the number of trained dietitians available for army service as well as for civilian service will be considered.

ACCORDING to the *Journal* of the American Medical Association, an informal advisory committee for the vitamin A industry has been appointed to confer with the Office of Price Administration regarding pricing and distribution problems. The committee held its first meeting in Washington, D. C., on July 27, to discuss provisions of a proposed maximum price schedule for vitamin A oils and concentrates. The advisory panel is an outgrowth of a recent industry conference held in San Francisco between the Office of Price Administration and all branches of the industry.

A BANQUET in honor of forty successful candidates in the first annual science talent search of the Science Clubs of America, sponsored by Science Service, Washington, D. C., was held in Washington on July 15. Among some 11,000 entrants, all seniors in secondary schools in the United States, 3,200 completed competitive examinations and wrote essays on "How Science Can Help Win the War." Three hundred of these entrants won special recognition; 260 of them were given honorable mention and 40 were chosen to take a prize trip to Washington. Eighteen Westinghouse Science Scholarships of \$200 each are

awarded to members of this group who have rated high in tests and interviews held in Washington. Westinghouse Science Scholarships of \$2,400 each are awarded to the boy and the girl receiving highest rating.

THE Rockefeller Foundation has made a grant of £1,875 towards the expenses of the Oxford Nutrition Survey during the past year and has promised a grant of £3,000 for each of the next two years. These funds will be administered by a committee consisting of the Regius professor of medicine, the Whitley professor of biochemistry, and the Waynflete professor of physiology, Sir Robert McCarrison, Sir Wilson Jameson and Dr. H. M. Sinclair. The survey is investigating economic, dietary, clinical and biological methods of assessing nutrition in man. Besides giving training in their use it is also on behalf of the Ministry of Health examining the nutrition of samples of the population.

AN Associated Press dispatch dated August 1 reports that the Battle Creek Sanitarium has now been given over to the Government and will be known as the Percy L. Jones General Hospital for war casualties. The purchase price was \$2,251,100. Lieutenant Colonel Norman T. Kirk, who will be at the head of a hospital staff of 700, said that it would be remodeled into long wards accommodating 1,000 beds at the start. The first patients will arrive about October 1 from military training centers where they have contracted ailments requiring long treatment. Former guests of the sanitarium have been transferred to several large adjacent buildings to continue treatment under the direction of Dr. John H. Kellogg.

*Nature* states that the University of Marburg, with the support of the Behring Works, has founded an Emil von Behring prize consisting of a medal and the sum of five thousand gold marks. It will be awarded every two years for scientific work in medicine, veterinary medicine or natural science, with special reference to immunity and control of epidemics.

## DISCUSSION

### COLOR BLINDNESS AND BORDERLINE CASES

NEVER was there greater need for exact specification of the color capabilities of the normal and aberrant eye. What has psychology to offer? The term "color blindness" itself is a misnomer, misleading and unduly depressing, even when qualified by "partial." Actually, the testimony of cases of unilateral defect or of retinal islands of partial deficiency, as well as the evidence from the outer zones of normal retinae, indicates that in ordinary red-green "blindness" color is

visible throughout the spectrum—blues and yellows in varying chromas and brightnesses (with a possible gray line at about 500 mμ).

Evidence, further, is steadily piling up of the frequency of "color weakness" and the various "anomalies" in which all four primaries and their derivatives are visible, though with the R-G pair weakened, sometimes unequally<sup>1</sup> (5, 661-702). Whether one of the pair is ever completely suppressed

<sup>1</sup> J. H. Nelson, "Anomalous Trichromatism," *Proceedings Physical Society*, London, 50, pp. 661-702, 1938.

without the other remains unproven. Numerous borderline cases have emerged, whether of super- or sub-sensitivity is undetermined. They fit no rubrics, and await exact measurement, for the physicist's classes, protanomalous and deuteranomalous, are purely theoretical, not descriptive. The Nagel anomaloscope and the Rayleigh equation ( $xR + yG = zY$ ) fail to show whether one component hue is weakened or the other intensified.

What analytical test procedures are available for mass measurements of the population? For speed, the clinician leans to the *pseudoisochromatic* group: Stilling, Ishihara, Schaaff, Edridge-Green, Jensen, Rabkin—German, Japanese, French, English, American, Russian—plates displaying mosaics of color dots on a white ground, with digits or geometric figures in confusion colors. But digits (used in the first two) are unequally legible, easily confusable, dependent on accuracy of refraction and acuity and readily memorizable. True, the eighth edition of the Ishihara (following criticism in 1935 and careless publication of keys to its plates) has sidestepped some of its earlier shortcomings. But its 30 inches distance is inconvenient and ignored, throwing designs out of gear by projecting them on unintended retinal areas. It discards color-weak along with color-blind through its use of moderate chromas only, and some of its designs fail to function as expected, owing possibly to the blue-weakness of the Oriental eye; e.g., the B and G digits of the familiar reversible design are misread by 25 per cent. of normals.

In certain Ishihara plates critical colors are cunningly interwoven to read one way to one type of eye, another way to another. But in the case of the plates diagnostic of so-called "red" and "green" blindness, designed to throw all cases into one or the other class according as they report the right or left digit, purplish or red—a considerable per cent. of "color blinds" read *both* or *neither*.

On most of the Japanese plates, however, something can be distinguished, whereas the spirits of the examinee sink steadily as blank plate after blank plate of the Stilling passes. True, the last edition of this German test, revised by Hertel, has copied some of the novelties of the Oriental and inserted a pair of diagnostic plates in R and purplish R. It contains also plates for B-Y deficiency. But the instructions are intricate and unintelligible in translation, and usually ignored by the examiner. Total scores in both the Stilling and the Ishihara are frequently misleading as to the gravity of the defect.

Combined use of the Ishihara with a few Stilling plates and Schaaff or Rabkin was recommended in 1937 by the British expert, Mary Collins,<sup>2</sup> for preliminary

<sup>2</sup> M. Collins, *Nature* (London), 140: 532-34 and 569-76, 1937.

segregation of "dangerous" color defectives. But war conditions have now cut off foreign editions. In 1939-40, to meet the emergency, an improved pseudoisochromatic test set was projected by the writer, but no printing-ink firm would guarantee the chromas and hues demanded. In 1940 the American Optical Company undertook to reproduce the most useful Ishihara and Stilling plates, but the critical chromas are often weak, the hues divergent (in the sample set examined by the writer), hence reasoning from the results of the older tests is unsafe, and no standardization of the new has to date been offered.

The Inter-Society Color Council in 1941, at the request of industrialists and clinicians, started work on a color discrimination test. Following the lead of the National Institute of Industrial Psychology of Great Britain,<sup>3</sup> who devised lacquered disks in R, B and Y chroma series in 1926 for serial grading and matching, R and RP series of glossy plastic chips in matched pairs, with many closely graded chromas steps from grey to medium saturation have been produced, and standardization of a "color aptitude" test is under way.

Industry meanwhile has taken the lead over psychological laboratories. The Institute of Paper Chemistry has devised its own matching tests, and the American Paper and Pulp Association has issued a monograph with many tables and curves for confusion colors.<sup>4</sup>

Convinced that only analytical study of thresholds of a number of hues will solve the enigmas of color vision, the writer is employing seven series of matched Munsell paper: R, B, G, BG and B chromas, and short strips of the special research 100-hue equal-chromas-and-value circle in the R's and G's, in conjunction with spectrometer and adaptometer observations. From the results, distribution curves will be plotted for color sensitivity in normal and aberrant; and the hypothesis that all degrees of sensitivity to the primaries link the congenital "color blind" with the normal-visioned be demonstrated or discredited.

Meanwhile the laboratory worker suggests that the psychologist, after consulting his Greek dictionary, scrap the non-descriptive and misleading rubrics of protanopia and deuteranopia and their derivatives, foisted on us in 1897 by the hasty generalizations and faulty experimental procedures of von Kries;<sup>5</sup> disavowed in 1932 by the eminent British authority on light, R. A. Houstoun,<sup>6</sup> and the source to-day of endless confusion and distortion of experimental observa-

<sup>3</sup> W. O'D. Pierce, "The Selection of Colour Workers." London: Isaac Pitman and Sons, 1934.

<sup>4</sup> American Paper and Pulp Association, "Color Blindness." Appleton, Wisconsin, 1941.

<sup>5</sup> E. Murray, *Am. Jour. Psychol.*, 42: 117-127, 1930.

<sup>6</sup> R. A. Houstoun, "Vision and Colour Vision." London: Longmans, Green and Company, 1932.

ions. The old term "color blind" may well go with them.

ELSIE MURRAY

CORNELL UNIVERSITY

### WARTIME SCIENTIFIC MANPOWER PRODUCTION

IN recent numbers of *SCIENCE*<sup>1</sup> there have appeared communications which manifest the growing demand for complete utilization of scientifically trained personnel. Through the facilities provided by the National Roster of Scientific and Specialized Personnel studies of the problems associated with utilization and assignment have been and are being studied and allocations are being made in various fields of science. The Roster is not simply an organized card file; it is proceeding as rapidly as possible in determining needs and allocating supply.

The problem it is considering at present is the mechanism by which we can supplement dwindling reserves in scientifically trained men. The process of robbing the universities to supply technically trained manpower has been carried to dangerous limits which, if pursued further, will result in the elimination of the future supply. The war has now progressed a sufficient length of time for us to realize that temporary expedients are not sufficient and that a long-range view will be necessary for the continuous replacement of scientific personnel which must be accomplished if we are to win this war.

The period of temporary expedients has enlisted the services of too great a number of scientists who are now removed from their main purpose of producing an adequate supply for future needs. This situation is inevitable at the beginning of an emergency but must now receive the thought and planning necessary for its correction.

The pressure of public and professional opinion must be impressed upon the individual to make each think of the best that he can produce for the total national good. This involves a critical self-analysis removed from social and patriotic glamor motives which almost inevitably sway the principles on which such a decision must be made. This inventory of service should have as its keystone the idea of production of an increasingly large number of scientific personnel. The schools, colleges and universities have compacted and revised their conventionalized schedules to make possible the earlier and steadier training which should produce new scientifically trained men in the minimum time and at that age when their scientific knowledge is most easily adapted to the armed services.

This war is dominantly one of ideas. It can be suc-

cessfully waged only by the complete use of brains and technological *knowledge* combined with mechanical instruments of war. Peace-time methods impose artificial limitations upon production of new scientists which in view of the continuing urgency must be removed. Independence of thought and action form a requisite part of any such program—each man represents a newly modified model as he leaves the academic production line. On that production line must be applied the most skilful teaching which science has ever had. Formulae which have been rigidly adhered to must be reevaluated and discarded if they can not be fitted to new conditions. Each man on the instruction assembly line must treat his product with respect to its own particular idiosyncrasies—the assembly line expert will not exercise his own. Standards and inspections must be rigid with a degree of flexibility at all other points. It is here that real teachers are needed, and it is here that the common methods of rote instruction must give way.

Standardization of many science courses has proceeded almost to the point of freezing their content and the methods of approach. This process must be revised and unfrozen in every case in which the new needs are evaluated in the light of increased production. Emphasis must be reapplied. To-day as never before broad and fundamental patterns of factual synthesis must be placed before the receptive minds which are to be scientifically trained.

The personal inventory mentioned above must be made in the light of this statement. The breach in curricular walls and the abolition of conventional schedules have left many an academic scientist in a state of emotional upheaval resulting in a sense of lost personal security. The insecurity so produced has immediately been transferred according to a principle of human nature which antedates scientific technology, for in times like these other pastures always appear greener and old responsibilities can always be side-tracked by the assumption of new ones. It is this factor which makes many scientists feel that they should be actively engaged in war work of a recognized variety when deep in their hearts they realize that their duties in their own environment are much more important to national welfare. It is harder to fight on the home front without official recognition than to transfer to other and perhaps different fields in which service may be less effective.

The universities have taken the only standpoint that could be taken in this emergency: they have unstintingly contributed their manpower and laboratory facilities. They too, must recognize that their essential purpose in national welfare is production of an increasing number of men trained to think. They must conserve their teaching manpower if this is to succeed.

The devastation of science departments by armed

<sup>1</sup> *SCIENCE*, 95: 2472, 507-8, May 15, 1942; *Ibid.*, 96: 2479, 16, July 3, 1942.

and governmental services must be rigidly scrutinized in the light of necessity. The resultant deterioration which shows absence of planning and foresight must not be allowed to continue. The universities' own needs must be weighed against other demands. The efficient future control of the destiny of the universities themselves requires the replacement of scientific manpower. These replacements must be accelerated both in tempo and quantity while quality must be maintained. The colleges and universities can play their part only by keeping active staffs intact and maintaining the morale of their teachers by recognizing this as a dominant part of the war effort.

JOHN S. NICHOLAS,  
*National Research Council Representative  
on the National Roster of Scientific and  
Specialized Personnel*

#### RUSSIAN-ENGLISH TECHNICAL DICTIONARY

THERE is an urgent demand at the present time for an up-to-date Russian-English dictionary of scientific

and technical terms. It is known that a number of Russian-English glossaries of specific terms have been compiled by various scientific institutions and individuals, and it is thought that it would be extremely helpful to scientists and technical translators if copies of these glossaries could be collected together and placed in the Science Library in London where one complete set could be consulted.

Will, therefore, any institution or individual who has compiled a glossary of Russian scientific or technical terms, whether printed or in MS, please send a copy to the Secretary, Anglo-Soviet Scientific Collaboration Sub-Committee, The British Council, 3 Hanover Street, W.1, London, England, who will collect these for the Science Library.

It is hoped at a later stage to compile a large dictionary, but the immediate aim is to collect the different glossaries in one place where they can be consulted. Each glossary will be known by the name of its compiler.

E. J. RUSSELL,  
*Chairman, Anglo-Soviet Scientific  
Collaboration Sub-Committee*

## SCIENTIFIC BOOKS

### LEUKEMIA IN ANIMALS

*Spontaneous and Experimental Leukemia in Animals.*  
By JULIUS ENGELBRETH-HOLM. 245 pages, 44 figures. Edinburgh and London: Oliver and Boyd. 1942.

THIS book of Engelbreth-Holm, published under the auspices of the Lady Tata Memorial Trust, is an authoritative and timely monograph. Leukemia, a cancer-like disease of the blood cell-forming organs, was little known until recent developments, reviewed in this book, focused the attention of increasing numbers of scientists and laymen on this disease. Leukemia is not an uncommon disease, and its incidence is seemingly rising. It arouses concern because it affects persons, young and old, who are often healthy in appearance, and the disease often follows a course of many years free of all symptoms, though it is rapidly fatal in many instances. Research men are being attracted to its study by the many avenues of investigation opened recently, making it possible to explore diverse problems of interest and significance. More than the importance of this disease itself, the hope that leukemia research will contribute to the understanding of cancer has induced most of our cancer research foundations and the National Cancer Institute to place it on their program.

The first part of the book is devoted to a historical survey of this disease, first recognized about one hundred years ago, and to a description of its occur-

rence and of its varied manifestations in different species of animals which contributed much to our knowledge of this disease and laid the foundation for experimental work.

The modern period of experimental leukemia dates back to 1908, when a Danish investigator, Ellermann, discovered the causation of avian leukemia by a filterable agent (virus). The discovery of Peyton Rous that chicken tumors are produced by viruses followed shortly and opened a productive period of research, during which chicken tumors and chicken leukoses and their causative filterable agents have been extensively investigated. Some twenty years later the transplantability of different mammalian leukemias was discovered. Engelbreth-Holm is among the pioneers who investigated the many problems of avian leukosis offered by the discoveries of his countryman, Ellermann; later he also contributed to the knowledge of mammalian leukemia. With the skill of a good teacher he sketches in this book the history and present status of leukemia research in a manner easily understandable to those not familiar with this disease. With the authority of an investigator he introduces research workers into the intricacies of newer knowledge, giving precise and complete reference to original articles. The field is covered in a systematic manner, and the book closes with a discussion of the nature of human and mammalian leukemia.

It is still not generally conceded that leukemia is

a type of cancer, but the evidence detailed in this monograph in favor of this view is overwhelming. The fact that some leukemias may be caused by a virus no longer opposes this view, for both typical avian and mammalian tumors are now known to be caused by viruses, even though the infectiousness of these viruses is obscure and their relation to viruses producing infectious diseases is subject to controversy. Such problems are treated objectively by Engelbreth-Holm. Although he was the first to publish experiments suggesting that mammalian leukemia (that of the mouse) is produced by a virus, the contradictory publications and criticisms are so thoroughly discussed as to take the pen away from those who are about to attack his views.

The gap between sarcoma and leukemia has been solidly bridged by studies of the avian disease through the finding of viruses which are capable of producing both diseases. Each of these viruses has distinctive features of its own characterized by specific cell affinities which seldom if ever change. The publications of Duran-Reynals which have recently shaken our belief in the specificity of these viruses have apparently appeared in print after the completion of this monograph.

In a field as new as this there are many avenues of research merely sketched by observations, many of which are of preliminary character. By discussing these observations at length, the text becomes vivid but open to controversy. I shall comment upon a few of these.

The significance of the "milk influence" of breast cancer is fully grasped by the author, and his assumption that it is a virus is well supported by more recent data. Credit for this discovery of great promise should have been given more clearly to Bittner and Little. As regards the existence of a similar influence on leukemia, the negative foster-nursing experiments of MacDowell and Richter and of Engelbreth-Holm are cited, but these findings have since been contradicted by others, including MacDowell. The newer studies indicate that the incidence of leukemia is likewise influenced by foster-nursing, even though this influence has not been shown to pass to the second generation as does the breast carcinoma influence.

Concerning the heredity in spontaneous leukemia, the controversial findings of MacDowell and of Slye are fully stated and the findings of the former are accepted as the rule. Again, more recent data and a reconsideration of all published studies in this field indicate that there is no single law of inheritance of leukemia. This varies with different stocks but is constant for each.

Immunity phenomena in transmissible leukemia are reviewed in great detail. The pattern of this research is similar to that developed years ago with common

transmissible tumors, and in the opinion of the reviewer many of these studies have not been found to apply to the natural disease. There are exceptions, such as the possibility of influencing the incidence of spontaneous leukemia by immunization. The transfer of immunity to leukemia by grafts or injections of splenic or liver tissue from immunized animals should be of great interest also to immunologists. The suggestive finding that the growth of highly virulent cells is retarded by immunization with embryonal tissues while the growth of slightly virulent cells is accelerated may serve to explain some anatomical manifestations of leukemia. Lymphosarcoma, long classified as a tumor, is considered as leukemia held in check by immune bodies. It is highly desirable to lay a more solid foundation to these suggestions. If confirmed, the question should be answered whether these findings with transmitted leukemia are applicable to the spontaneous disease. Certainly malignant tumors proliferate until the host is destroyed; whether they engender the formation of antibodies at all and, if so, how these antibodies modify the course of a neoplastic disease remain to be elucidated.

The experimental production of leukemia, an accomplishment of the past few years, is thoroughly surveyed. Certain agents, such as carcinogenic hydrocarbons, estrogens and x-rays, are powerful "leukemogens," even though their action is influenced by hereditary factors; the leukemogenic action of cell-free extracts of leukemic tissues or of embryonal tissues is still shrouded in mystery. But knowledge is accumulating on both hereditary and environmental factors, and this may ultimately lead to an understanding of the genesis of spontaneous leukemia.

The scope of leukemia research is beyond that of a neoplastic disease. A perusal of this book shows how the metabolism studies of leukemic nodes disclosed novel phenomena of special interest to those concerned with tissue metabolism in general, such as the influence of host factors upon the metabolism of malignant cells, certain preleukemic metabolic changes and the possible existence of an inhibitor of anaerobic glycolysis circulating in blood of leukemic animals. Although there are many obscure points concerning these studies, they are highly stimulating. The investigations with x-rays and radio-active substances should be of special concern to those interested in radiobiology of malignant tissues, and the heredity studies to those concerned with mammalian genetics. The latter show, under carefully controlled conditions, how known and unknown extrinsic factors modify hereditary tendencies, obscuring the recognition of the precise laws of inheritance of a neoplastic disease. Certain immunity studies, even if referred to by some scholars of cancer as mere "intellectual gymnastics," should be of great interest to those concerned with

the laws of survival of tissue grafts or with individual differentials, and certainly to all immunologists.

The high standard of production of this book is complimentary to the publisher and editors, and much of its contents to research men in this country.

Among the latter E. C. MacDowell and associates of the Carnegie Institute deserve special mention for their large share in recent contributions.

JACOB FURTH

CORNELL UNIVERSITY MEDICAL COLLEGE

## SOCIETIES AND MEETINGS

### THE AMERICAN DIABETES ASSOCIATION

THE American Diabetes Association, a new organization founded in 1940, held its first annual meeting in Cleveland on June 1, 1941, the official family including Honorary President Elliott P. Joslin, President Cecil Striker, First Vice-President Herman O. Mosenthal and others prominent in the field of diabetes. Active members are physicians, but all interested in the aims of the association are eligible for election as associate members. It is dedicated to the problems of the diabetic, medical, social and economic, and aims to elevate standards of medical treatment by dissemination of the knowledge of diabetes, coordination of activities of associated groups, collection and publication of statistical data and encouragement of research in all phases of the subject. A volume has been issued containing the proceedings of the meeting.

This volume includes a secretarial report by Samuel S. Altshuler, Detroit; a presidential address by Cecil Striker, Cincinnati; "Sir Frederick Banting," by C. H. Best, Toronto (reprinted from *SCIENCE*, 93: 243, 1941); an address by Elliott P. Joslin, Boston, "Diabetes Yesterday, Today and Tomorrow"; and papers on "The Prevention of Diabetes," by R. E. Haist and C. H. Best, Toronto; "The Etiology of Diabetic Acidosis," by Arthur Mirsky, Cincinnati; "Comments on Nutritional Requirements," by Russell M. Wilder, Rochester, Minnesota; "Standards of Diabetic Therapy," by Herman O. Mosenthal, New York City, and "Avoidance of Degenerative Lesions in Diabetes Mel-

litus," by Julian D. Boyd, Robert L. Jackson and James H. Allen, Iowa City.

Haist and Best report that degenerative lesions of the pancreatic islets and the resultant diabetes which occur in dogs during administrations of sufficient doses of pituitary extract (Houssay-Young) can be prevented by diets low in carbohydrate and high in fat with supplementary insulin administration and suggest trial of the method in incipient human diabetes. Wilder draws attention to conclusions of the Committee on Food and Nutrition of the National Research Council as to vitamin requirements of normal diets and suggests that they be considered in prescribing diets for diabetics. Mirsky reviews the history of the conception that ketosis in diabetes depends on a limitation of glucose oxidation, contending that it depends rather on a limitation of storage as glycogen in the liver. Mosenthal asks for a revision of the doctrine that any elevation of the blood sugar concentration above the norm is necessarily to be combatted in all types and degrees of diabetes, and brings evidence to show that it is better ignored in some situations. Boyd, Jackson and Allen support the proposition that degenerative sequelae of diabetes (cataracts, arteriosclerosis, etc.) are late results of inadequate control of the diabetes, a view not shared by many writers. The discussion of all papers which are exceptionally full and illuminating lead to a harmonization of a number of erstwhile variant views.

R. T. WOODYATT

CHICAGO

## REPORTS

### PROJECT GRANTS OF THE GEOLOGICAL SOCIETY OF AMERICA

THE Council of the Geological Society of America has authorized the following project grants:

*General Structure, Geomorphology and Stratigraphy—\$2,950.*

F. J. Pettijohn, University of Chicago, will spend six weeks in a detailed study of the Huronian-Archean contact in the Menominee and Calumet districts of Michigan. Preliminary study of basal conglomerates has proven the pre-Huronian age of the granite northeast of the Menominee. It is proposed to extend this work into the Calumet district, where post-Huronian granites are reported, in order to differentiate the two granites. \$200.

Lowell R. Laudon, University of Kansas, will complete a five-year study of the stratigraphy of the Mississippian of New Mexico. The contribution to the stratigraphy and geologic history of New Mexico will also make possible a comparison with the Mississippian of the upper Mississippi Valley and the Rocky Mountain province. \$250.

Paul A. Siple, United States Antarctic Service, Miami University, Ohio, will construct several large-scale maps of the Bay of Whales region of Ross Shelf Ice, Antarctica, from oblique photographs taken by the Byrd Antarctic Expeditions of 1929 and 1934 and the United States Antarctic Service in 1940. The maps will serve as a basis for determining quantitative deformation of the ice, and model theory suggests that further detailed studies will

contribute to understanding tectonic features of the earth's crust. \$1,500.

H. E. Wood, 2nd, University of Newark, as chairman of a committee of the Society of Vertebrate Paleontology, will select copy for and supervise preparation of a series of colored plates representing important type localities or significant described sections to accompany a paper on the Continental Tertiary of the Rocky Mountains and High Plains. The project will provide a test of the value of colored plates as a tool for the use of stratigraphers. \$1,000.

#### *Paleontology—\$1,135.*

Claude W. Hibbard, University of Kansas, will collect Pliocene and Pleistocene vertebrate fossils from unconsolidated gravels in Clark County, southwestern Kansas, in extension of six seasons of field work in adjacent counties. The gravels of fossiliferous beds are put through screens of proper size to recover small fragments and teeth. The work to date has produced four new High Plains Pliocene and Pleistocene vertebrate fossils, descriptions of which have been published. \$450.

M. K. Elias, State Geological Survey of Nebraska, will spend six weeks in central Colorado collecting the *Walchia* flora from lower Pennsylvanian rocks. *Walchia* was formerly regarded as a Permian plant, and the beds that Elias will study are the oldest conifer-bearing beds known. \$325.

Robert G. Chaffee, Academy of Natural Sciences, Philadelphia, will set up an inter-museum card catalogue of vertebrate paleontological specimens of North America. \$360.

#### *Geophysics—\$4,700.*

N. B. Keevil, Department of Physics, University of Toronto, will study the distribution of radiogenic heat in North American granitic rocks. Radioactivity measurements are made, and a rapid method of requisite accuracy is being developed from previous work upon 1,000 rocks.

Representative specimens will be obtained from geological surveys, universities, museums and mining companies. The project will provide a reliable average value for the rate of production of radioactive heat in North American granitic rocks and determine the extent of regional geothermal anomalies on this continent. \$2,500.

G. P. Woollard, Princeton, New Jersey, will continue his investigation of the subsurface geological conditions along the eastern seaboard by a magnetic and gravitational survey. The survey to date has extended from New England to Washington and will now be extended to Florida. Reports on the transcontinental survey in 1940 and the more detailed examination along the northeastern seaboard in 1941 are in hand for early publication. \$2,200.

#### *Economic Geology—\$400.*

John S. Brown, Balmat, New York, will study the relation of porosity to ore deposition in the metamorphosed Grenville limestone of St. Lawrence County, New York. Porosities of diamond drill cores have been determined, and Dr. Brown will now carry out a thin-section study of the same cores to determine the size of openings. A preliminary report has been published in Technical Paper 1194, American Institute of Mining and Metallurgical Engineers, "Factors of Composition and Porosity in Lead-Zinc Replacements of Metamorphosed Limestone." \$400.

#### *Glacial Geology—\$140.*

Chauncey D. Holmes, University of Missouri, will make a detailed study of glacial transport and progressive changes in the shape of tillstones of known origin in west-central New York. The region is especially favorable for the study because the glacial ice moved at right angles to the strike of lithologically distinctive formations. The study was begun in 1937, and two papers have been published, one in the *American Journal of Science* and one in the *Bulletin of The Geological Society of America*. \$140.

## SPECIAL ARTICLES

### THE "SULFANILAMIDE EFFECT" OF SUBSTANCES DEVOID OF SULFO GROUPS

SULFANILAMIDE and its derivatives reduce *in vitro* the speed of bacterial growth; complete bacteriostasis is attained as the maximal effect.<sup>1</sup> The effect of sulfanilamides is inhibited by p-aminobenzoic acid.<sup>2</sup> The efficiency of sulfanilamides is explained by their structural similarity to p-aminobenzoic acid; they displace this "essential metabolite"<sup>3</sup> or "growth factor"<sup>4,5</sup> from its enzyme's surface. The competition of essential metabolites of the carbonic acid type

with analogous sulfonic acid compounds has been demonstrated by McIlwain, applying nicotinic acid amide  $\rightleftharpoons$  pyridin-3-sulfonic acid amide<sup>6</sup> and  $\alpha$ -amino acids  $\rightleftharpoons$   $\alpha$ -amino sulfonic acids,<sup>7</sup> further by Kuhn, Wieland and Möller<sup>8</sup> with pantothenic acid  $\rightleftharpoons$  sulfo-pantothenic acid. The following two observations demonstrate that analogous substances devoid of sulfo groups are also able to displace p-aminobenzoic acid.

#### (1) THE ANTIBACTERIAL EFFECT OF P-AMINO-BENZAMIDE AND ITS INHIBITION BY P-AMINO-BENZOIC ACID

Material for inoculation: 24 hours culture of *B. coli*

<sup>6</sup> H. McIlwain, *Brit. Jour. Exp. Path.*, 21: 136, 1940.

<sup>7</sup> H. McIlwain, *ibid.*, 22: 148, 1941.

<sup>8</sup> R. Kuhn, Th. Wieland and E. F. Möller, *Ber. Deuts. Chem. Ges.*, 74: 1605, 1941.

<sup>1</sup> J. Hirsch, in press.

<sup>2</sup> D. D. Woods, *Brit. Jour. Exp. Path.*, 21: 74, 1940.

<sup>3</sup> P. Fildes, *Lancet*, 1: 955, 1940.

<sup>4</sup> S. D. Rubbo and J. M. Gillespie, *Nature*, 146: 838, 1940.

<sup>5</sup> R. Kuhn and K. Schwarz, *Ber. Deuts. Chem. Ges.*, 74: 1617, 1941.

TABLE 1

		Test-tube No.	1	2	3	4	5	6	7
		Inoculation per 5 ml	1	$\frac{1}{10}$	$\frac{1}{10^2}$	$\frac{1}{10^3}$	$\frac{1}{10^4}$	$\frac{1}{10^5}$	$\frac{1}{10^6}$ drop
Growth after 43 hours at 37° C									
a	Control		+	+	+	+	+	+	—
b	p-Aminobenzamide	1.10 <sup>-3</sup> M	+	+	—	—	—	—	—
b'	p-Aminobenzamide	1.10 <sup>-3</sup> M	+	+	+	+	+	+	+
c	Sulfanilamide	1.10 <sup>-3</sup> M	+	—	—	—	—	—	—
c'	Sulfanilamide	1.10 <sup>-3</sup> M	+	+	+	+	+	+	—
	p-Aminobenzoic acid	1.10 <sup>-4</sup> M	+	+	+	+	+	+	—

on a synthetic medium for staphylococci.<sup>9</sup> Medium: 10.53 per cent. of ammonium chloride, 0.3 per cent. of glucose, 0.5 per cent. of sodium sulfate, 0.01 per cent. of magnesium chloride, phosphate buffer (M/15) pH 7.2; each 5 ml.

The bacteriostatic effect of p-aminobenzamide is almost as strong as that of equimolecular quantities of sulfanilamide; both effects are suppressed by p-aminobenzoic acid.

(2) THE ANTIBACTERIAL EFFECT OF P-AMINOPHENYL-  
ARSINIC ACID (ATOXYL) AND ITS INHIBITION  
BY P-AMINOBENZOIC ACID

Atoxyl reduces the speed of bacterial growth, but no complete bacteriostasis is attained. The speed of bacterial growth in aerobic cultures has been determined by continuous measurement of the oxygen consumption in Warburg vessels.<sup>10</sup>

Material for inoculation: 13 hours culture of *B. coli* on a synthetic medium; one drop per 30 ml was inoculated in the same medium.

TABLE 2

Culture No.	I	II	III	IV	V	VI
Addition	—	—	Atoxyl 1.10 <sup>-3</sup> M	Atoxyl 1.10 <sup>-3</sup> M p-Aminobenzoic acid 1.10 <sup>-4</sup> M		
Hours after inoculation	mm <sup>3</sup> Oxygen consumption per ml in 30 minutes					
3 00	4	4	2	3	6	4
3 30	11	9	7	7	13	11
4 00	23	20	13	13	28	26
4 30	51	40	20	20	49	46
5 02	91	70	30	28	76	75
5 34	126	115	37	38	103	99

p-Aminophenylarsinic acid (atoxyl) acts in the same way but decidedly weaker than sulfanilamide and p-aminobenzamide. This corresponds to the lesser antibacterial efficiency of free sulfanilic acid.

Among the derivatives of p-aminobenzamide possibly a further new group of substances with chemotherapeutic effects towards bacterial infections might be found. Other substances, too, devoid of sulfo

groups, but structurally related to p-aminobenzoic acid, should be tested with regard to their chemotherapeutic effects.

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### ENZYME ACTION

JUST as the adsorptive capacity of finely ground activated charcoal for methylene blue is decreased by narcotics, so it appears that the activity of enzymes is reduced similarly by the same narcotics.

In plant physiology there is an experiment whose object is adsorption and whose procedure involves the mixing of finely ground activated charcoal with an aqueous solution of methylene blue. Under the correct proportion which varies with the concentration of methylene blue and the adsorptive potency of the finely ground activated charcoal, the filtrate is clear and devoid of methylene blue. The conclusion is that the methylene blue has been adsorbed by the finely ground activated charcoal. The experiment also directs the students to add ethyl alcohol to the residue, whereupon the filtrate becomes deep blue and the conclusion is that alcohol decreases the adsorptive capacity of the charcoal particles.

The students in plant physiology at the University of South Dakota performed this experiment in January, 1942, shortly after the meetings of the American Association for the Advancement of Science in Dallas, and when the prize-winning paper was still fresh in my mind. As most of you may recall, the prize was awarded to Johnson, Brown and Marsland for the paper entitled "The Mechanism of Temperature and Hydrostatic Pressure Reversal of Narcosis in Luminous Bacteria."<sup>1</sup> The research involved the action of narcotics on luciferase, the enzyme which is responsible for luminescence in luminous bacteria. The investigators found that narcotics readily reduce the intensity of luminescence, clearly indicating a decrease in enzymatic activity.

<sup>9</sup> P. Fildes and G. M. Richardson, *Brit. Jour. Exp. Path.*, 18: 292, 1937.

<sup>10</sup> J. Hirsch, *Enzymologia*, 4: 94, 1937.

<sup>1</sup> Frank H. Johnson, Dugald E. S. Brown and Douglas A. Marsland, *Anat. Rec.*, 81: 4, Supplement, page 33, 1941.

The experiment in plant physiology dealing with adsorption brought to my mind this fundamental question when the experiment was being discussed with the students. If ethyl alcohol reduces the adsorptive capacity of charcoal particles for methylene blue, will ether, chloroform, barbital and sulfanilamide have the same effect? Preliminary tests did show that each drug separately reduced the adsorptive capacity of charcoal particles for methylene blue.

Other tests to determine the threshold value of each drug followed. The threshold value is the maximum amount of drug which will not produce any decrease in adsorption. Less amounts have no apparent effect and larger amounts affect the adsorption progressively more. One gram of the finely ground charcoal<sup>2</sup> on hand in the botany laboratory was found to adsorb all the methylene blue from 13 ml of a 1 per cent. aqueous solution but no more. With this set-up it was rather simple to determine the threshold value for each drug. A standard mixture of one gram of charcoal particles and 13 ml of the 1 per cent. aqueous methylene blue with the addition of slightly more than the threshold value of a certain drug would produce a blue filtrate upon filtration.

The threshold values for a number of narcotics are given in Table 1. The concentration value is based on the total amount of mixture, which in every case was 100 ml. The temperature was close to 25° C.

TABLE 1  
THE THRESHOLD VALUES FOR SOME NARCOTICS WHICH AFFECT THE ADSORPTIVE POTENCY OF ACTIVATED CHARCOAL PARTICLES FOR METHYLENE BLUE

Narcotic	Threshold value based on amount in total mixture (100 ml)
Ethyl alcohol .....	8 per cent.
Ether .....	1 " "
Chloroform .....	0.5 " "
Sodium barbital .....	0.1 " "
Sulfanilamide .....	0.025 " "
Saponin .....	0.06 " "

Table 2 presents data dealing with the effect of the narcotics on the action of diastase. In every case 10 ml of 1 per cent. soluble starch, 1 ml of a 1 per cent. diastase solution and enough narcotic to give the stated concentration were diluted to 20 ml. The concentration for each narcotic is based on the final solution volume of 20 ml. The temperature was close to 25° C.

TABLE 2  
THE EFFECT OF SOME NARCOTICS ON THE DIGESTIVE ACTION OF DIASTASE

Narcotic and its concentration	Minimum time for soluble starch solution to be digested past the last iodine staining stage
Control (no narcotic added) ..	15 minutes
Ethyl alcohol 25 per cent. ....	30 "
Chloroform 25 per cent. ....	25 "
Saponin 0.25 per cent. ....	25-30 "
Sodium barbital 0.25 per cent. .	180 "a
Sodium barbital 0.10 per cent. .	70 "
Sulfanilamide 0.25 per cent. ...	20 "b

a. Retarded 165 minutes; b. Retarded 5 minutes.

It is most interesting to note the differential effects of sulfanilamide on charcoal particles and diastase. While sulfanilamide is extremely potent in its effect on the adsorption of methylene blue by charcoal particles, it is only mildly effective in arresting the digestive action of diastase on soluble starch. This difference may be fundamental in explaining why sulfanilamide is so effective in combating body pathogens without critically and dangerously upsetting the regular essential metabolic activities of the host's body. To be exact, sulfanilamide is about four times as potent as sodium barbital in reducing the adsorptive capacity of charcoal particles for methylene blue, but only one thirty-third as drastic as sodium barbital in its retardation of diastatic action on soluble starch.

That enzyme action is adsorptive becomes even more certain when one finds that the effect of ether, alcohol and chloroform on the adsorptive potency of charcoal particles for methylene blue is canceled wholly or in part by the application of hydrostatic pressure. This is exactly what Johnson, Brown and Marsland reported for luciferase in luminous bacteria.

The action of narcotics on diastase appears to be the same as that on charcoal particles, which unquestionably had their adsorptive capacity for methylene blue reduced thereby. It may, therefore, be concluded that enzyme action is fundamentally an adsorptive process. The doubt in the minds of Johnson, Brown and Marsland as to whether the effect of barbital, sulfanilamide and p-aminobenzoic acid was chemical or adsorptive can now be removed.

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## SCIENTIFIC APPARATUS AND LABORATORY METHODS

### THE CHEMICAL COMPOSITION OF LIVER PREPARATIONS

SINCE the discovery, about fifteen years ago, of the

curative action of liver in pernicious anemia, much has been learned of the nature of the active substance and the procedures for extraction.

Methods for extraction and analytical results, including my own studies, have been published else-

<sup>2</sup> Charcoal, activated, for decolorizing, about 80 mesh. Will Corporation, Rochester, N. Y.

where.<sup>1</sup> From one kilogram of fresh liver I obtained 5.8 grams of yellowish brown powder as a silver salt. From the analytical results the presence of three free COOH groups, eighteen -CO-NH- groups and a molecular weight of approximately 10,000 was deduced.

Dakin and West<sup>2</sup> separated the inactive part with ammonium sulfate, magnesium sulfate and sodium chloride, and finally precipitated the active part with Reinecke salt. In this way they obtained a compound constituting 1 per cent. of the original dried weight and with a nitrogen content of 15.3 per cent., which they treated as a polypeptide and glucosamine. In a later publication Dakin, Ungley and West,<sup>3</sup> by a more refined method of extraction, obtained a fraction with 16.2 per cent. nitrogen which is characteristic of an albumose type, without glucosamine, and established a molecular weight of 3-5000. Sladek, Savezycka and Lipschuetz<sup>4</sup> demonstrated the old thesis that free amino groups derived from amino acids exist. Subbarow, Jacobsen and Prochownick<sup>5</sup> have isolated 2 milligrams of a crystalline sulfate from 100 grams of liver, a product which seems to be identical with that described by Lalund and Klemm.<sup>6</sup> Karrer, Frei and Fritsche<sup>7</sup> found in the active fraction a pentose and adenin, and believe that the activity is proportional to the phosphorus content, obtaining a maximum of 3.8 per cent. P.

In 1939 I began some new experiments. The extraction and purification methods were simplified. Each kilogram of milled liver was extracted with one-third volume of water and 6 cc of 20 per cent. sulfuric acid at 35° C. After pressing, this process was repeated at 50° C, 60° C and 70° C. The expressed liquids were mixed together and treated with Ba(OH)<sub>2</sub> at 50° C until a pH of 6.5-6.7 was obtained, warmed to 60° C and filtered. After concentrating in vacuum to one seventh of its volume at 40° C, 99 per cent. alcohol was added until an alcohol concentration of 70 per cent. was reached. After filtering and evaporating the alcohol (in vacuum at 40° C) the liquid was concentrated to half its volume, filtered and precipitated with AgNO<sub>3</sub>. This salt was decomposed with HCl, filtered, and the solution precipitated with alcohol. The precipitate was dissolved in N/10 NaOH to pH 7.2 and with silver nitrate a new silver salt is isolated which has the following composition:

C .....	67.50	per cent.
H .....	6.41	" "
O .....	4.60	" "
N total .....	14.40	" "
N amino .....	1.40	" "
S .....	0.99	" "
P .....	1.06	" "
Ag .....	5.04	" "

The acid part of the substance had a molecular weight of 6,000. It contained three free COOH groups, as did the product obtained several years ago. Remaining are six free amino groups, this number increasing to eighteen after hydrolysis (5 hours of ebullition with HCl or 25 per cent.). From this the presence of twelve bonds of -CO-NH- is deduced. One kilogram of fresh liver gave 2.09 grams of this substance which was extraordinarily active in clinical tests.

For an approximate estimation of the potency of liver extracts the combination of the chemical method (fractional precipitation with alcohol) of Schales<sup>8</sup> and my biological test,<sup>9</sup> based on the influence of phenylhydrazine anemia, was found satisfactory. The results were confirmed by the clinical test of the reticulocyte response.

#### SUMMARY

For the present we can entertain the following ideas regarding the chemical structure of the active fraction of liver in pernicious anemia: it is an amino acid complex with three free COOH groups, it contains sulfur and phosphorus, is soluble in water, acids and bases, precipitates in alcohol at concentration greater than 87 per cent., and has a molecular weight of 6,000.

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<sup>8</sup> Schales, *Klin. Wochenschr.*, 16: 277, 1937.

<sup>9</sup> Erdos, *Biochem. Zeitschr.*, 277: 342, 1935.

#### BOOKS RECEIVED

- Biological Action of the Vitamins.* Edited by E. A. EVANS, JR. Pp. ix + 227. Illustrated. The University of Chicago Press. \$3.00.
- HAYNES, WILLIAMS. *The Stone that Burns.* Pp. xii + 345. Illustrated. D. Van Nostrand Company, Inc. \$3.75.
- HOLMES, HARRY N. *Strategic Materials and National Strength.* Pp. 106. Illustrated. Macmillan. \$1.75.
- MOORE, JUSTIN H. and JULIO A. MIRA. *The Gist of Mathematics.* Pp. xii + 726. Illustrated. Prentice-Hall. \$4.00.
- MORRIS, MAX and ORLEY A. BROWN. *Differential Equations.* Pp. xi + 355. Prentice-Hall. \$3.00.
- BOJAHN, C. A. and F. GIRAL. *Preparacion de productos quimicos y quimico-farmacuticos.* Two volumes. Pp. xxxix + 1002. Editorial Atlante, S.A., Mexico, D.F.

<sup>1</sup> Erdos, *Biochem. Zeitschr.*, 277: 337, 1935.

<sup>2</sup> Dakin and West, *Jour. Biol. Chem.*, 109: 489, 1935.

<sup>3</sup> Dakin, Ungley and West, *Jour. Biol. Chem.*, 115: 771, 1936.

<sup>4</sup> Sladek, Savezycka and Lipschuetz, III. Kongr. Slovenskih Aptekar. Jugoslaviji, Prague, page 266, 1935.

<sup>5</sup> Subbarow, Jacobsen and Prochownick, *Jour. Am. Chem. Soc.*, 58: 2234, 1936.

<sup>6</sup> Lalund and Klemm, *Acte med. Scand.*, 88: 620, 1936.

<sup>7</sup> Karrer, Frei and Fritsche, *Helv. Chim. Acta*, 20: 622, 1937.